LGNPDF

PURPOSE
Compute the standard lognormal probability density function.

DESCRIPTION
A variable X is lognormally distributed if the variable Y=LN(X) is normally distributed. The standard lognormal probability density function is:

$$f(x) = \frac{e^{\frac{-(\ln(x))^2}{2\sigma^2}}}{x\sigma\sqrt{2\pi}} \qquad \text{for } x \geq 0 \qquad \textbf{(EQ 8-255)}$$

where σ is a shape parameter. The mean is $\exp(\sigma^2/2)$ and the standard deviation is sqrt($\exp(\sigma^2)(\exp(\sigma^2)$-1)).

SYNTAX
LET <y2> = LGNPDF(<y1>,<s>)   <SUBSET/EXCEPT/FOR qualification>
where <y1> is a non-negative variable, a number, or a parameter;
    <s> is an optional number or parameter that specifies the shape parameter (defaults to 1 if omitted);
    <y2> is a variable or a parameter (depending on what <y1> is) where the computed lognormal pdf value is stored;
and where the <SUBSET/EXCEPT/FOR qualification> is optional.

EXAMPLES
LET A = LGNPDF(3)
LET A = LGNCDF(3,0.6)
LET Y = LGNPDF(X1)

NOTE
The general lognormal probability density function is:

$$f(x) = \frac{e^{\frac{-\left(\ln\left(\frac{x-\theta}{m}\right)\right)^2}{2\sigma^2}}}{(x-\theta)\sigma\sqrt{2\pi}} \qquad \text{for } x \geq \theta \qquad \textbf{(EQ 8-256)}$$

where θ is a location parameter and m is a scale parameter. See topic (3) under the General considerations section at the beginning of this chapter for a discussion of generating pdf values for the general form of the distribution. The general distribution has a mean of $m*\exp(\sigma^2/2)$ and the standard deviation is sqrt($m^2\exp(\sigma^2)(\exp(\sigma^2)$-1)).

Earlier versions of DATAPLOT only supported lognormal pdf values with a shape parameter of 1. The current version defaults the shape parameter to 1 if it is not specified.

DEFAULT
None

SYNONYMS
None

RELATED COMMANDS
LGNCDF	=	Compute the lognormal cumulative distribution function.
LGNPPF	=	Compute the lognormal percent point function.
HFNCDF	=	Compute the half-normal cumulative distribution function.
HFNPDF	=	Compute the half-normal probability density function.
HFNPPF	=	Compute the half-normal percent point function.
NORCDF	=	Compute the normal cumulative distribution function.
NORPDF	=	Compute the normal probability density function.
NORPPF	=	Compute the normal percent point function.

REFERENCE

"Continuous Univariate Distributions - 1," Johnson and Kotz, Houghton Mifflin, 1970 (chapter 14).

"Statistical Distributions," 2nd ed., Evans, Hastings, and Peacock, Wiley and Sons, 1993 (chapter 25).

APPLICATIONS

Fatigue life distribution, particle size distribution

IMPLEMENTATION DATE

94/4 (support for the shape parameter added 95/1)

PROGRAM

```
TITLE LGNPDF FOR SIGMA = 1, 0.6, 1.2
XLIMITS 0 10
XTIC OFFSET 0.2 0.2
X1LABEL X
Y1LABEL PROBABILITY
LINE SOLID DASH DOT
PLOT LGNPDF(X) FOR X = 0.01 0.01 10.0 AND
PLOT LGNPDF(X,0.6) FOR X = 0.01 0.01 10 AND
PLOT LGNPDF(X,1.2) FOR X = 0.01 0.01 10
```